

## INTERACTION BETWEEN *TRICHODERMA* SPP. TO CONTROL *GANODERMA* SP. IN PLANTINGS OF *ACACIA MANGIUM*

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### ABSTRACT

*Ganoderma* sp. must be controlled with environmental friendly measures, such as *Trichoderma* spp. which has already been proven in this field. The objectives of this study were to identify interactions between isolates of *Trichoderma* spp. which were applied deliberately, and naturally occurring *Trichoderma* spp. isolates in the field. *Trichoderma* spp. isolates T<sub>13</sub> and T<sub>62</sub> in pellet form were applied in a ratio of five pellets to each *Acacia mangium* seedling, following which the *A. mangium* seedlings were planted in the field. At the ages twelve months, the level of attack by *Ganoderma* sp. was counted at sampling intensity of 100%, and soil samples were taken from around the plantings with a sampling intensity of 20% in order to identify the presence of isolates T<sub>13</sub> and T<sub>62</sub>. The results of identification through macroscopic and microscopic observation as well as dual culture tests, point back to isolates which appear to be T<sub>13</sub> and T<sub>62</sub>. In addition, results of the study showed that for 12-months old *A. mangium*, the use of applications of T<sub>62</sub> lead to a lower level of attack by *Ganoderma* sp. in plantations of *A. mangium* (2.67%) compared to applications of T<sub>13</sub> (4.83%) and the control (3.83%). In the case of PDA medium, T<sub>62</sub> isolate demonstrated a better prevention effect against *Ganoderma* sp. (95.91%) compared to T<sub>13</sub> (91.63%). Interaction between *Trichoderma* spp. isolates T<sub>13</sub> and T<sub>62</sub> and several other isolates of *Trichoderma* spp. indicated there was competition for both nutrition and growing space.

**Keywords :** *Trichoderma* spp., *Ganoderma* sp., *Acacia mangium*

### INTRODUCTION

Land clearing are not perfect by reduce stumps and root remnants that have been infected with one of the major causes of increased intensity of root rot disease (root rot) caused by the fungus *Ganoderma* sp. According to [1], in the countries of Southeast Asia and India the disease caused high mortality (3,2 to 40%). In Sumatra, fungal pathogens have resulted in the death of *A. mangium* age of six months in the logged forest [6].

Appropriate control measures need to be done. Development of control methods by utilizing the antagonist agent feels quite promising. *Trichoderma* spp. is known to have antagonistic ability against another's agent so that the opportunity to be developed into a biological control agent to fungus *Ganoderma* sp. [9]. Colonization by *Trichoderma* spp. on seedling roots and rhizosphere are expected to persist after the seedlings are planted in the field.

This study aimed to obtain information on how to: the ability of *Trichoderma* spp. pressing the attack rate of *Ganoderma* sp. in plantation *A.*

*Trichoderma* spp. As part of a broader scope of research on control of *Ganoderma* sp. in planting *A. mangium*, this study is expected to provide useful scientific information about the ability of *Trichoderma* spp. in the control of *Ganoderma* sp. on planting of *A. mangium*.

### MATERIALS AND METHODS

The study was conducted on *A. mangium* plantation in the District of Basrah Regency of Kuantan Sengingi Riau Province and Laboratory of Forest Protection and Health Faculty of Forestry University of Gadjah Mada University in Yogyakarta. *Trichoderma* spp. which apply isolates derived from *Trichoderma* spp. that have been tested have potential biological control agent collection Laboratory of Forest Protection and Health Faculty of Forestry GMU (T<sub>13</sub>) and local isolates of planting *A. mangium* in RAPP (T<sub>62</sub>). *Trichoderma* spp. formulation was applied in the form of pellets [10] of 5 (five) points of pellets each seedling *A. mangium*. Furthermore, seedlings planted after the age of 10 weeks in the field.

This study uses three (3) treatment: (1) seedlings of *A. mangium* without the addition of



*Trichoderma* spp., this treatment was used as a control given the notation T<sub>0</sub>, (2) seedlings of *A. mangium* added *Trichoderma* spp. collection isolates Laboratory of Forest Protection Health Faculty of Forestry GMU (T<sub>13</sub>), the treatment is given the notation (T<sub>13</sub>), and (3) seedlings of *A. mangium* added *Trichoderma* spp. local isolates of planting *A. mangium* RAPP (T<sub>62</sub>), the treatment is given the notation T<sub>62</sub>. Each treat is made as many as six replications and each replication used 100 seedlings *A. mangium* as a research unit. This study used a research design Completely Randomized Block Design (RCBD). Deuteronomy is used as a research block. Each unit of study consisting of 100 seedlings per treatment on planted in a plot planting.

*Acacia mangium* age of 12 months was to measured levels of *Ganoderma* sp. attack with 100% sampling intensity and sampling of soil around the plant samples. Soil samples from each plant sample to composite based treatments and replications of the study. The suspension of isolated soil samples to identify the presence of isolates of *Trichoderma* spp. which has been applied as in the nursery. Identification is done by observation of macroscopic, microscopic and direct confrontation test [2]. Results re-isolation isolates of *Trichoderma* spp. use to inhibition test on PDA medium (Potato Dextrose Agar) of *Ganoderma* sp. which has been isolated from the study site. Two isolates of *Trichoderma* spp. which has the highest inhibition, two isolates of *Trichoderma* spp. which has the lowest inhibition and isolates the alleged re-isolation T<sub>13</sub> and T<sub>62</sub> was observed by microscopic interactions.

Another sign that is easily recognizable from *Ganoderma* sp attack was the fund of fruiting bodies at the base of the stems and red rhizome at the root of the affected skin. Observations attack rate *Ganoderma* sp. on *A. mangium* (Figure 1) showed that *Trichoderma* spp. T<sub>62</sub> isolates had the lowest attack rate (2.67%). The ability of local isolates (T<sub>62</sub>) are better at controlling *Ganoderma* sp. in planting *A. mangium* than a collection of isolates (T<sub>13</sub>) allegedly due to growing environmental suitability. Local isolates originating from the same environment will surely have a higher adaptability to be able to grow and develop properly.

Fertility rate which describes the environmental conditions are relatively uniform plantation trials and conducive to growth and development of *Trichoderma* spp. and to support plant growth *A. mangium*. This reinforces the assumption that differences in levels of *Ganoderma* spp. attack on *A. mangium* are not influenced by environmental factors in this case of death caused by differences in levels of fertility and environmental conditions.

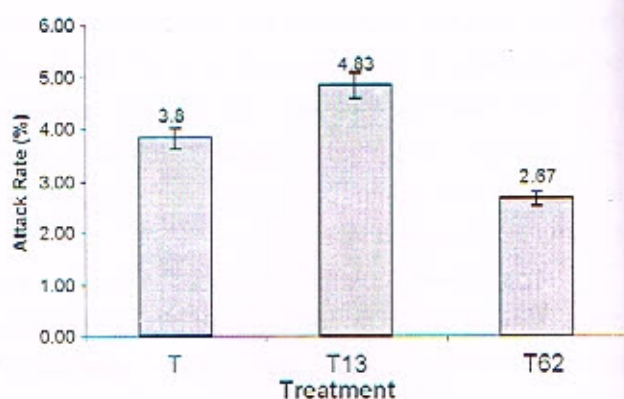


Figure 1. Graphic of *Ganoderma* sp. attack rate on *A. mangium*. Description: (T<sub>0</sub>) Without the addition of *Trichoderma* spp.; (T<sub>13</sub>) Addition of *Trichoderma* spp. isolates T<sub>13</sub>; (T<sub>62</sub>) Addition of *Trichoderma* spp. isolates T<sub>62</sub>.

## RESULTS AND DISCUSSION

### 1. Inhibitory potential of *Trichoderma* spp. to *Ganoderma* sp. at planting *Acacia mangium*

Plants are attacked by *Ganoderma* sp. generally show symptoms of wilting, leaf yellowing, peeling bark, leaves falling and dying shoots. The

### 2. Re-isolation *Trichoderma* spp. Isolates T<sub>13</sub> and T<sub>62</sub>

Of the several types of *Trichoderma* isolates were found to identify the presence of isolates T<sub>13</sub> and T<sub>62</sub>. This is done by looking at the macroscopic and microscopic morphological similarity of *Trichoderma* isolates were found with isolates of T<sub>13</sub> and T<sub>62</sub>



(Figure 2). Isolates of *Trichoderma* spp. re-isolation results which have similar morphological features subsequently grown together in a Petri dish with stock isolates ( $T_{13}$  and  $T_{62}$ ).

The results show that the identification of *Trichoderma* spp. isolates  $T_{13}$  and  $T_{62}$  which has been applied suspected of planting the soil is still found in *A. mangium*. Thus it can be believed that the control of *Ganoderma* sp. on planting *A.mangium* is affected by the treatment of application *Trichoderma* spp. isolates  $T_{13}$  and  $T_{62}$ .

Gomez et al. [2] explains, the results of studies that use direct confrontation test showed a

compatible relationship between *Trichoderma* derived from the same group, it is shown by the merger (fusion) of mycelium between the two isolates. Interaction is not found in cell death. In contrast, the interactions between isolates originating from different groups indicate the presence of cell death and damage to the plasma membrane. Not barring the discovery of the growth zone at the second meeting of the colony is suspected because of a compatible relationship between stock isolates with isolates re-isolation results. It is an indicator that these isolates originated from the same group (a species).

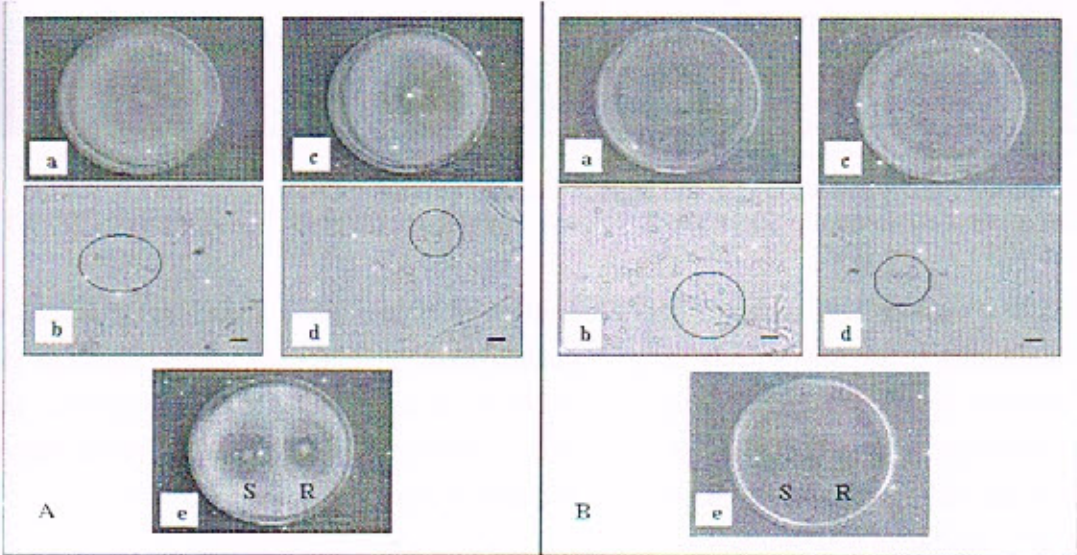


Figure 2. Identification of *Trichoderma* spp. re-isolation isolates  
Description: (A)  $T_{13}$  Isolates, (B)  $T_{62}$  Isolates (a) macroscopic observation of stock isolates, (b) microscopic observation of stock isolates, (c) macroscopic observation of re-isolation isolates; (d) microscopic observation of re-isolation isolates; (e) The direct confrontation test, (S) Isolates stock; (R) isolates re-isolation (bar: 10  $\mu$ m).

3. Inhibitory Potential of *Trichoderma* spp. to *Ganoderma* sp. on in vitro

*Trichoderma* spp. as antagonist agent able to inhibit the growth, survival and infection caused by pathogens through the mechanism of competition, antibiosis or mikoparasit [8]. Inhibitory potential of *Trichoderma* spp. isolates to *Ganoderma* sp. on PDA medium (Table 1) show TR.II.4 isolates had the best inhibitory power (96.80%) than other isolates.  $T_{62}$  isolates also showed high inhibitory

same place would be more effective than with isolates originating from different places.

Table 1. The mean inhibitory potential *Trichoderma* spp. on PDA media

No	<i>Trichoderma</i> spp. Isolates from Re-Isolation	The mean inhibitory potential (%) (Observation on 15 <sup>th</sup> day)
1.	TR.II.4	96.80 a
2.	$T_{62}$	95.91 a b
3.	TR.II.11	94.34 a b c
4.	TR.II.9	93.05 a b c d
5.	TR.II.15	92.82 a b c d
6.	TR.II.7	92.62 a b c d
7.	$T_{13}$	91.63 a b c d e
8.	TR.II.2	91.59 a b c d e
9.	TR.II.8	91.17 a b c d e
10.	TR.II.5	89.25 a b c d e
11.	TR.II.12	88.71 a b c d e
12.	TR.II.13	87.52 b c d e
13.	TR.II.14	87.36 b c d e
14.	TR.II.10	86.44 c d e f
15.	TR.II.6	84.69 d e f
16.	TR.II.3	83.59 e f
17.	TR.II.1	78.61 f



#### 4. Interactions between isolates *Trichoderma* spp. on in vitro

In nature, isolates of *Trichoderma* spp. grow and develop at the same place to grow. In these conditions the interaction will occur between isolates of *Trichoderma* spp. Observations show

that there is interaction between the growing space competitions Isolates *Trichoderma* spp. (Figure 3). Competition is an interaction of between organisms in the fight over the same things, like food substances or living space [5].

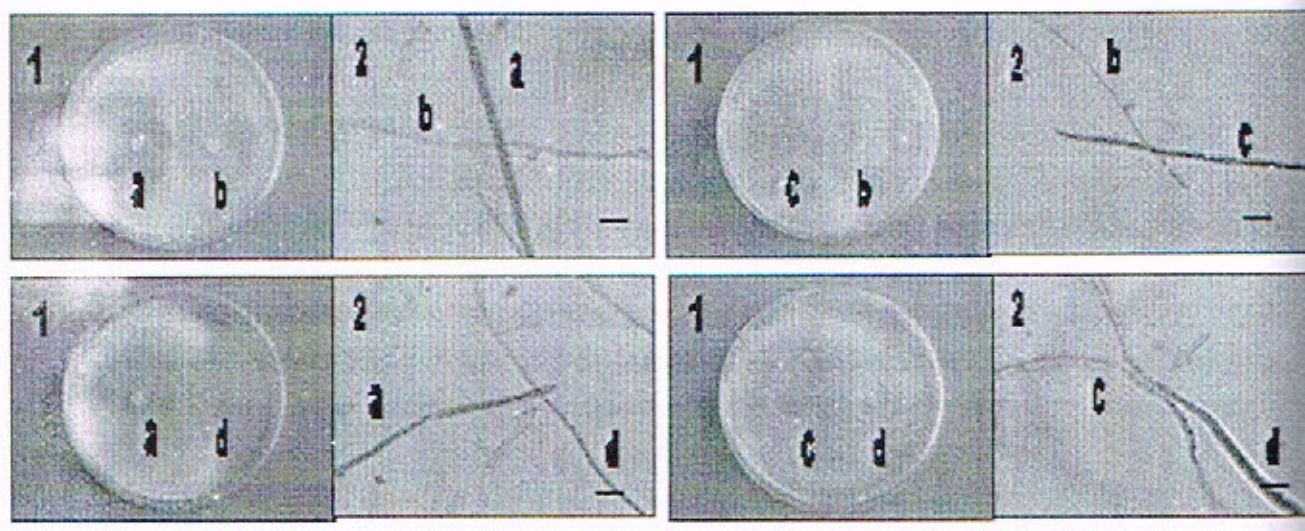


Figure 3. Interaction isolates of *Trichoderma* spp. re-isolation result

Description: (1) macroscopic observation, (2) microscopic observations: (a) Isolates  $T_{13}$ , (b) Isolates TR.II.4; (c) Isolates  $T_{62}$ , (d) Isolates TR.II.1 (bar : 10  $\mu$ m).

The ability of the growth of isolates of *Trichoderma* spp. determines to win the competition in the interaction between isolates of *Trichoderma* spp. Isolates of *Trichoderma* spp. which have high growth capability will be able to grow and thrive better than isolates of *Trichoderma* spp. that has the ability to lower growth.

In this study shows that  $T_{62}$  isolates showed the best growth capability so it can be expected to win the competition among isolates of *Trichoderma* spp. Thus,  $T_{62}$  isolates able to grow and develop properly so as to generate potential control the better of *Ganoderma* sp. These conditions also reinforce consideration of the benefits of the use of local isolates as biological control agents.

#### CONCLUSIONS

1. *Trichoderma* spp. local isolates ( $T_{62}$ ) has a more effective inhibitory potential of *Ganoderma* than

2. Isolates of *Trichoderma* spp. which has been applied ( $T_{13}$  or  $T_{62}$ ) with several isolates of *Trichoderma* spp. other results of re-isolation on in vitro interact through competition mechanisms nutrients and growing space.

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